

CLAIMS

1. A space cross-connect unit (Z) with N input ports (E_i) and P output ports (S_i), comprising:
 - a broadcast stage comprising at most N signal dividers (A_i) each having one input and C outputs where C is an integer factor of P less than P, each input being connected to one of said N input ports (E_i) so that each of said N dividers (A_i) divides a signal received at one of said N input ports (E_i) into C signals at said C outputs, and
 - a space switching stage comprising at most C space switching modules (B_i, B'_i),which cross-connect unit is characterized in that:
 - the C space switching modules (B_i, B'_i) are non-blocking and non-broadcasting, and
 - each of said C modules (B_i, B'_i) has N inputs and P/C outputs, said N inputs are connected to N outputs of said broadcast stage, each of said N outputs comes from a different divider (A_i), and each of said P/C outputs of said C modules (B_i, B'_i) is connected to a respective one of said P output ports (S_i).
2. A cross-connect unit (Z) according to claim 1, comprising exactly N dividers (A_i) and C modules (B_i, B'_i).
3. A cross-connect unit (Z) according to claim 1, characterized in that each of said C modules (B_i, B'_i) comprises means for connecting each of its N inputs to one of its P/C outputs.
4. A cross-connect unit (Z) according to claim 1, characterized in that each of said C switching modules (B_i, B'_i) is a non-blocking switching matrix (B_i) with N inputs and P/C outputs.
5. A cross-connect unit (Z) according to claim 1,

characterized in that each of said C switching modules (B'_i) comprises:

- K non-blocking switching matrices (F_i) with N/K inputs and P/C outputs, where K is an integer factor of N; and
- 5 · P/C non-blocking switching matrices (G_i) with K inputs and one output, each of said K inputs being connected to a respective output of each of said K switches (F_i).

6. A cross-connect unit (Z) according to claim 1,
10 characterized in that at least one of said C switching modules (B'_i) comprises:

- K non-blocking switching matrices (F_i) with N/K inputs and P/C outputs, where K is an integer factor of N; and
- P/C non-blocking switching matrices (G_i) with K inputs
- 15 and one output, each of said K inputs being connected to a respective output of each of said K switches (F_i).

7. A cross-connect unit (Z) according to claim 1,
characterized in that said P/C switching matrices (G_i) are
20 semiconductor optical amplifier (SOA) switches.

8. A cross-connect unit (Z) according to claim 1,
characterized in that said number N of input ports is
equal to said number P of output ports.

25 9. A cross-connect unit (Z) according to claim 5,
characterized in that K is equal to C.

10. A cross-connect unit (Z) according to claim 1,
30 characterized in that said switching stage uses a technology based on LiNbO_3 .

11. A cross-connect unit (Z) according to claim 1,
characterized in that each of said P/C outputs of said C
35 modules (B_i , B'_i) is followed by an amplifier (D_s).

12. A cross-connect unit according to claim 1,

characterized in that each of said N inputs of said N dividers is preceded by an amplifier (D_E).

13. A cross-connect unit (Z) according to claim 1,
5 characterized in that each of said space switching modules (B_i , B'_i) comprises:
- a first stage comprising polarization-maintaining space switching matrices (M_1 , ..., M_k); and
 - a second stage comprising polarization-maintaining
10 semiconductor optical amplifiers ($MQWSOPA_1$, ..., $MQWSOA_k$).

14. A signal transmission system comprising a cross-connect unit (Z) according to any one of claims 1 to 13 and characterized in that said system comprises:
- 15 · at least one multiplexer for multiplexing M signals having M different wavelengths $(\lambda_i)_{1 \leq i \leq M}$, where M is an integer less than or equal to N;
- at least one erbium-doped fiber amplifier (EDFA) for amplifying the multiplexed signal; and
- 20 · at least one demultiplexer for demultiplexing the multiplexed signal to yield M demultiplexed signal that are input to M input ports of said cross-connect unit.